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PATENT

Attorney Docket No. MASIMO.186A

Date: October 19, 1999

Page 1

jc588 U.S. PTO
09/422208
10/19/99

ASSISTANT COMMISSIONER FOR PATENTS

WASHINGTON, D.C. 20231

ATTENTION: BOX PATENT APPLICATION

Sir:

Transmitted herewith for filing is the patent application of

Inventor(s): James Price Coffin IV

For: SYSTEM FOR DETECTING INJECTION MOLDING MATERIAL

Enclosed are:

- (X) Two (2) sheets of drawings.
- (X) Recordation form cover sheet with 1-page assignment.
- (X) A power of attorney form and copy of assignment.
- (X) Initial signed declaration by inventor(s).
- (X) Return prepaid postcard.

CLAIMS AS FILED

FOR	NUMBER FILED	NUMBER EXTRA	RATE	FEES
Basic Fee			\$760	\$760
Total Claims	7 - 20 =	0 x	\$18	\$0
Independent Claims	3 - 3 =	0 x	\$78	\$0
TOTAL FILING FEE		\$760		

- (X) A check in the amount of \$760 to cover the filing fee is enclosed.
- (X) A check in the amount of \$40 to cover the assignment recording fee.
- (X) The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Account No. 11-1410. A duplicate copy of this sheet is enclosed.
- (X) Please use Customer No. 20,995 for the correspondence address.


Stephen C. Jensen
Registration No. 35,556
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SIXTEENTH FLOOR
NEWPORT BEACH, CALIFORNIA 92660-8016
(949) 760-0404
FAX (949) 760-9502
INTERNET WWW.KMOB.COM



EL207464255US

LOUIS J. KNOBBE*
DON W. MARTENS*
GORDON H. OLSON*
JAMES B. BEAR
DARRELL L. OLSON*
WILLIAM B. BUNKER
WILLIAM H. NIEMAN
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OF COUNSEL
JERRY R. SEILER
JAPANESE PATENT ATTY
KATSUHIRO ARAI**
EUROPEAN PATENT ATTY
MARTIN HELLEBRANDT
KOREAN PATENT ATTY
MINCHEOL KIM
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(NON-LAWYERS)
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Attorney Docket No. : MASIMO.186A
Applicant(s) : James Coffin IV
For : SYSTEM FOR DETECTING INJECTION
MOLDING MATERIAL
Attorney : Stephen C. Jensen
"Express Mail"
Mailing Label No. : EL 207 464255 US
Date of Deposit : October 19, 1999

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09/42208
10/19/99

I hereby certify that the accompanying

Transmittal in Duplicate; Specification in 7 pages; Two sheets of drawings; Declaration by Inventor in 1 pages; Recordation Form Cover Sheet and Assignment in 2 pages; Power of Attorney by Assignee in 2 pages; Check(s) for Filing Fee(s); Return Prepaid Postcard

are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and are addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Donald King

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SYSTEM FOR DETECTING INJECTION MOLDING MATERIALBackground of the Invention5 Field of the Invention

The present invention relates in general to encapsulation using optically clear compounds, and more particularly to processes such as pour molding, transfer molding, casting, and injection molding.

Background

10 Injection molding is a widely used manufacturing process. In general, the process begins with the injection of a molten stock material, typically a thermoplastic or thermosetting resin, into a mold having several pieces. After the stock material is injected into the mold, it is allowed to cure, and the pieces of the mold are separated to release the product.

15 The process can be repeated to produce a plurality of instances of the desired product. To repeat the process, the completed product is removed from the mold, and any remaining stock material is removed from the pieces of the mold. The pieces of the mold are then reassembled, and the molten stock material is again injected into the mold.

20 Occasionally, a transparent stock material is used in an injection molding process. When using a transparent stock material, it can be difficult to detect and remove the remaining stock material when the pieces of the mold are separated at the end of the process. If the pieces of the mold are not fully cleaned before the mold is reused, the remaining stock material can create flaws in subsequent instances of the

25 desired product.

30 In addition, injection molded products are often inspected for flaws using optical inspection equipment. When the injection molded products are transparent, it can be difficult for the inspection equipment to detect flaws in the products. If the inspection equipment fails to detect a flaw in an injection molded product, then the product may malfunction during use.

Summary of the Invention

One aspect of the present invention involves a system for detecting a normally transparent injection molding material. According to the present invention, the injection molding material contains a fluorescent colorant, which is invisible when not exposed to ultraviolet light, but becomes visible when exposed to ultraviolet light. The method comprises exposing the injection molding material to ultraviolet light. The system involves an ultraviolet light to expose the colorant.

Another aspect of the present invention involves a method of cleaning an injection molding material from an injection mold and removing the material upon detection. The method involves exposing the mold having injection molding material containing a fluorescent compound to ultraviolet light and removing the material upon detection through the fluorescent colorant.

Another aspect of the present invention involves a method of inspecting a substantially transparent product with an optical instrument, the method comprising incorporating the product with fluorescent colorant and exposing the product to ultraviolet light.

Certain aspects, advantages and features of the present invention are described in the specific embodiment. Not necessarily all such advantages may be achieved in accordance with any particular embodiment of the invention. The invention may be embodied or carried out in a manner that achieves one advantage or group of advantages without necessarily achieving other advantages.

Brief Description of the Drawings

These and other aspects, advantages, and novel features of the invention are apparent upon reading the following detailed description and upon reference to the accompanying drawings. The present invention is described in more detail below in connection with the attached drawings, in which:

Figure 1A illustrates a cross-sectional view of an injection mold used in one embodiment of the present invention.

Figure 1B illustrates a top view of the lower piece of the injection mold illustrated in Figure 1A.

Figure 2 illustrates a cross-sectional view of the injection mold illustrated in Figure 1A after use.

5 Figure 3 illustrates a product made in accordance with one embodiment of the present invention undergoing an inspection procedure.

Detailed Description of a Preferred Embodiment

10 Figure 1A illustrates a cross-sectional view of an injection mold 100 used in one embodiment of the present invention. The injection mold 100 of the illustrated embodiment comprises an upper piece 102a and a lower piece 102b.

Figure 1B illustrates a top view of the lower piece 102b of the injection mold 100. In the illustrated embodiment, the lower piece 102b comprises a plurality of nozzles 108 and a corresponding plurality of gates 110.

15 When aligned along a separation line 104, the upper and lower pieces 102a and 102b of the injection mold 100 form a main runner 105, an annular runner 106, and a cavity 112. The main runner 105 extends from the outside of the injection mold 100 to the annular runner 106. The annular runner 106 provides an interface between the main runner 105 and the nozzles 108 and corresponding gates 110 of the lower piece 102b. The gates 110 extend from the nozzles 108 into the cavity 112.

20 In operation, a molten stock material is injected into the main runner 105. The stock material comprises any suitable injection molding material that is substantially transparent. Furthermore, the substantially transparent stock material contains a fluorescent colorant, which is substantially invisible to the eye when not exposed to ultraviolet light, but becomes visible to the eye when exposed to ultraviolet light.

25 After being injected into the main runner 105, the molten stock material flows into the annular runner 106, where it is distributed to the nozzles 108. The gates 110 are then opened, thereby injecting the molten stock material into the cavity 112. The molten stock material is then allowed to cool. The upper and lower pieces 102a and 102b of the injection mold 100 are then separated to release the desired product.

Figure 2 illustrates the injection mold 100 after the upper and lower pieces 102a and 102b have been separated to release the product 202. In the illustrated embodiment, the product 202 comprises a ball. In other embodiments, the product 202 is any product that can be manufactured using any stock material.

5 After the upper and lower pieces 102a and 102b of the injection mold 100 are separated, the product 202 is removed from the injection mold 100. As illustrated in Figure 2, remnants 204 of the stock material may remain attached to the injection mold 100 after the product 202 is removed.

10 Before the injection mold 100 is used again, any remnants 204 of the stock material are removed from the injection mold 100. Because the stock material may be a transparent material, remnants 204 of the stock material can be difficult to detect in the injection mold 100. In the present invention, the upper and lower pieces 102a and 102b of the injection mold 100 are exposed to ultraviolet light, thereby causing the fluorescent colorant in the stock material to become visible to the eye or to automated optical 15 inspection equipment. An ultraviolet light 109 is activated to expose the fluorescent colorant. Accordingly, remnants 204 of the stock material remaining in the injection mold 100 can be detected and removed more easily.

20 After the remnants 204 of the stock material are removed from the mold 100, the upper and lower pieces 102a and 102b of the mold 100 are realigned and reassembled along separation line 104. The injection molding process may then be repeated to manufacture a plurality of instances of the product 202.

25 Figure 3 illustrates a inspection system 300, in accordance with one embodiment of the present invention. The inspection system 300 comprises an inspection device 302 and a product 202. The inspection device 302 may comprise any suitable optical inspection device used to inspect molded products. The product 202 may comprise any suitable product that is can be manufactured using a molding process. The product 202 contains a fluorescent colorant, which is substantially invisible to the inspection device 302 when not exposed to ultraviolet light, but becomes visible to the inspection device 302 when exposed to ultraviolet light.

In use, the inspection device 302 inspects the product 202 for flaws. Such inspection systems are well known in the art. Because the product 202 may be transparent, it can be difficult for the inspection device 302 to detect flaws in the product 202. Therefore, the product 202 is exposed to ultraviolet light while being inspected, 5 thereby causing the fluorescent colorant in the product 202 to become more visible to the inspection device 302. In the present embodiment, the inspection device 302 is configured to be responsive to the fluorescent colorant in the product 202 to perform its inspection operations. Accordingly, the inspection device 302 can detect flaws in the product 202 more easily.

10 Although the foregoing invention has been described in terms of certain preferred embodiments, other embodiments will become apparent to those of ordinary skill in the art in view of the disclosure herein. Accordingly, the present invention is not intended to be limited by the recitation of preferred embodiments, but is intended to be defined solely by reference to the appended claims.

WE CLAIM:

1. A method of detecting an injection molding material, comprising:
incorporating a fluorescent colorant into the injection molding material;
and
5 exposing the injection molding material to ultraviolet light.
2. The method of Claim 1, further comprising removing the injection molding material from a piece of an injection mold.
3. A method of detecting an injection molding material containing a fluorescent colorant, the method comprising exposing the injection molding material to ultraviolet light and examining the molding material while exposed to the ultraviolet 10 light
4. The method of Claim 3, wherein the fluorescent colorant is substantially transparent when not exposed to ultraviolet light.
5. The method of Claim 3, further comprising removing injection molding material from an injection mold based upon the detection and the examination while exposed to ultraviolet light.
15
6. The method of Claim 5, wherein the fluorescent colorant is substantially invisible when not exposed to ultraviolet light.
7. A method of testing a substantially transparent product with an optical 20 tester, the method comprising:
incorporating fluorescent colorant with the product; and
exposing the product to ultraviolet light; and
examining the product with an optical testing device which is responsive to the fluorescent colorant when exposed to ultraviolet light.

SYSTEM FOR DETECTING INJECTION MOLDING MATERIAL

Abstract of the Disclosure

5 A system is provided for detecting a substantially transparent injection molding material. The injection molding material contains a fluorescent colorant, which is invisible when not exposed to ultraviolet light, but becomes visible when exposed to ultraviolet light. A method of detecting the injection molding material involves exposing the injection molding material to ultraviolet light and examining the material during exposure.

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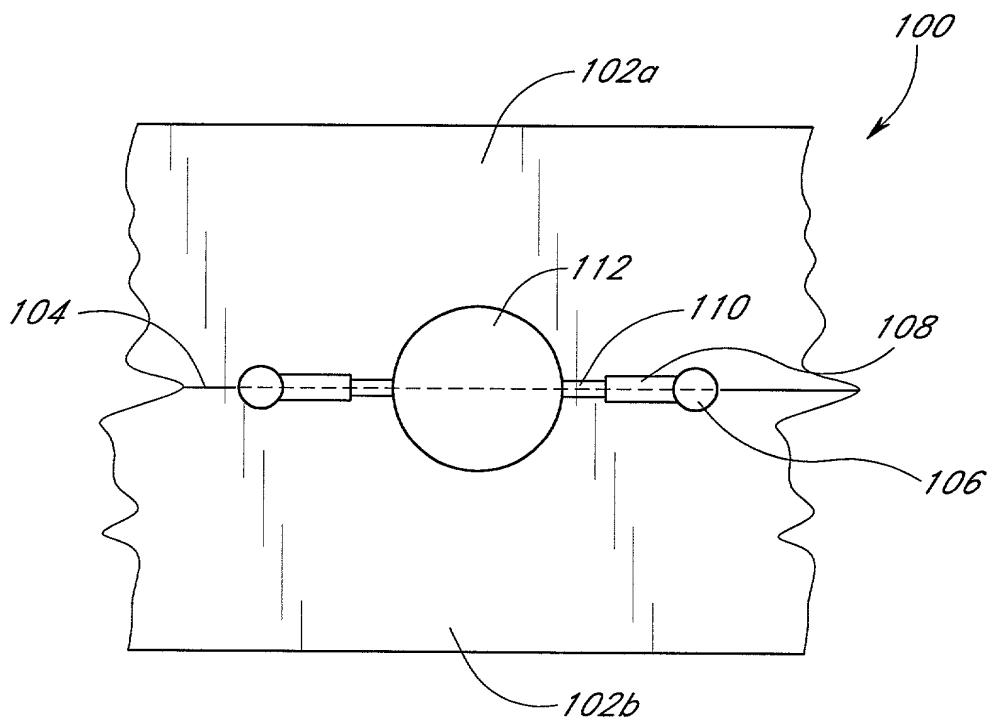


FIG. 1A

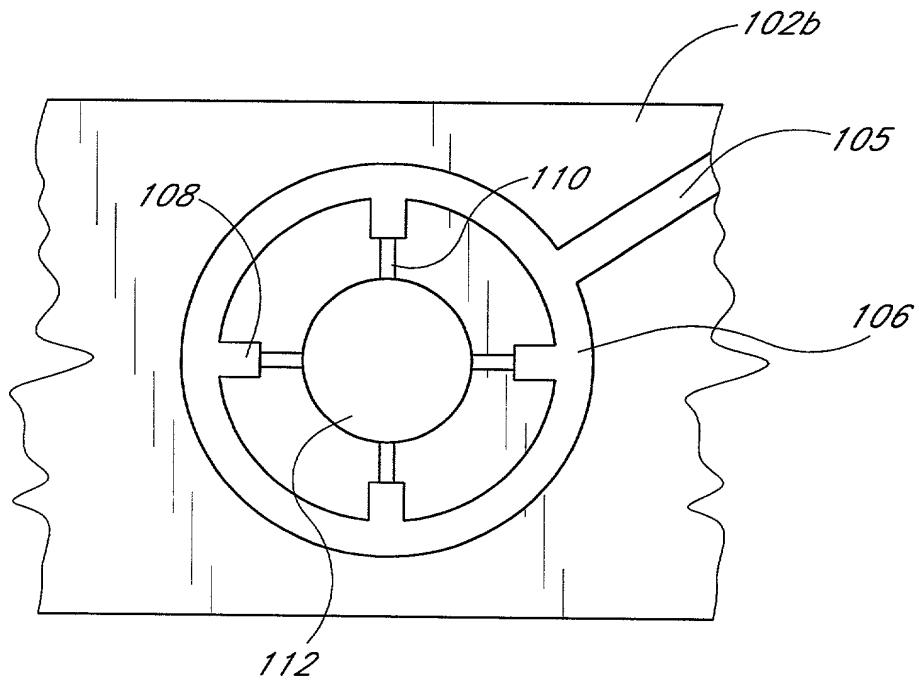


FIG. 1B

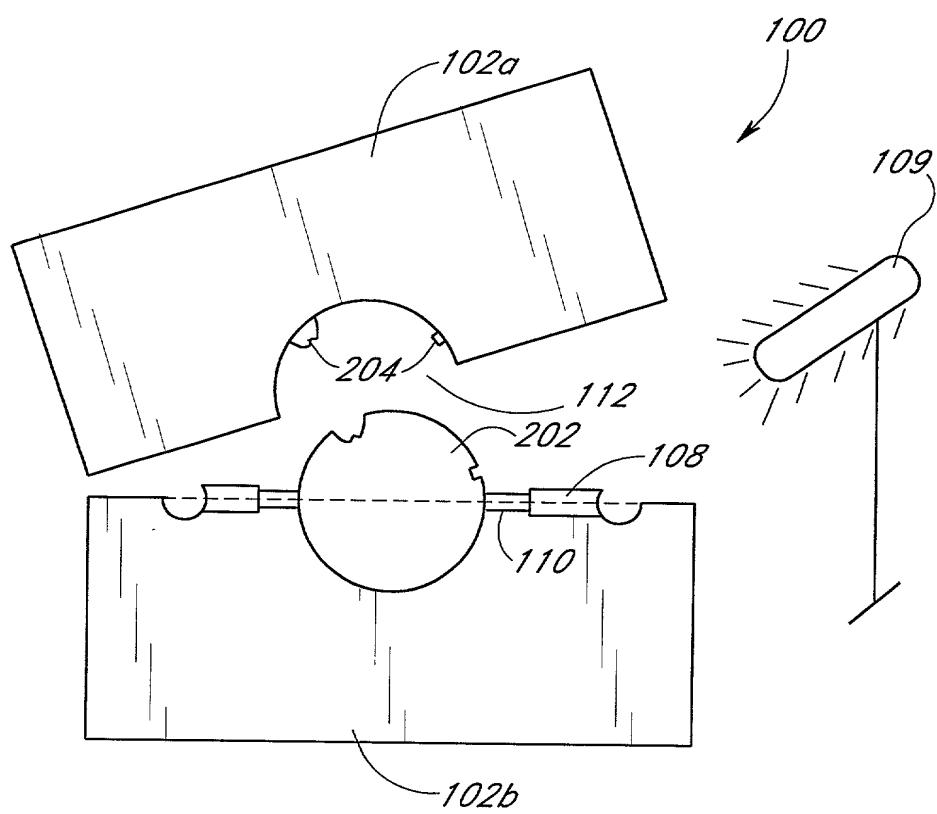


FIG. 2

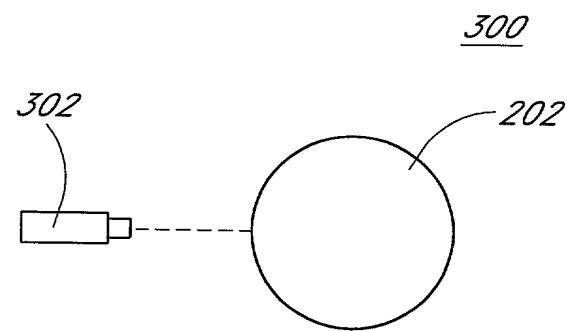


FIG. 3

DECLARATION - USA PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled SYSTEM FOR DETECTING INJECTION MOLDING MATERIAL; the specification of which is attached hereto;

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above;

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56;

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole inventor: **James Price Coffin IV**

Inventor's signature James Price Coffin, IV
Date 3 October 1999

Residence: **19623 Orvinto Drive, Trabuco Canyon, CA 92679**

Citizenship: **United States**

Post Office Address: **same**

Send Correspondence To:
KNOBBE, MARTENS, OLSON & BEAR, LLP
Customer No. 20,995

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : James Price Coffin IV)
App. No. : Unknown)
Filed : Herewith)
For : SYSTEM FOR DETECTING)
INJECTION MOLDING MATERIAL)
Examiner : Unknown)

ESTABLISHMENT OF RIGHT OF ASSIGNEE TO TAKE ACTION
AND
REVOCATION AND POWER OF ATTORNEY

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

The undersigned is empowered to act on behalf of the assignee below (the "Assignee"). A true copy of the original Assignment of the above-captioned application from the inventor(s) to the Assignee is attached hereto. This Assignment represents the entire chain of title of this invention from the Inventor to the Assignee.

I declare that all statements made herein are true, and that all statements made upon information and belief are believed to be true, and further, that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and that willful, false statements may jeopardize the validity of the application, or any patent issuing thereon.

The undersigned hereby revokes any previous powers of attorney in the subject application, and hereby appoints the registrants of Knobbe, Martens, Olson & Bear, LLP, 620 Newport Center Drive, Sixteenth Floor, Newport Beach, California 92660, Telephone (949) 760-0404, Customer No. 20,995, as its attorneys with full power of substitution and

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Filed : Herewith

revocation to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected herewith. This appointment is to be to the exclusion of the inventor(s) and his attorney(s) in accordance with the provisions of 37 C.F.R. § 3.71.

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MASIMO CORPORATION

Dated: 10-3-99

By: Massi Kiani
Massi E. Kiani

Title: President & Chief Executive Officer

Address: 2852 Kelvin Avenue, Irvine, CA 92614

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